WORLD RESOURCES INSTITUTE

BUILDING MOMENTUM FOR ELECTRIC SCHOOL BUSES

SUE GANDER, DIRECTOR, ELECTRIC SCHOOL BUS INITIATIVE (PRESENTATION TO ICC WORKSHOP ON 1/12/22)

WRI'S ELECTRIC SCHOOL BUS (ESB) INITIATIVE

WRI'S AIM: ELECTRIFY THE ENTIRE U.S. FLEET BY 2030

Goal: **An Equitable Transition to Electric School Buses**

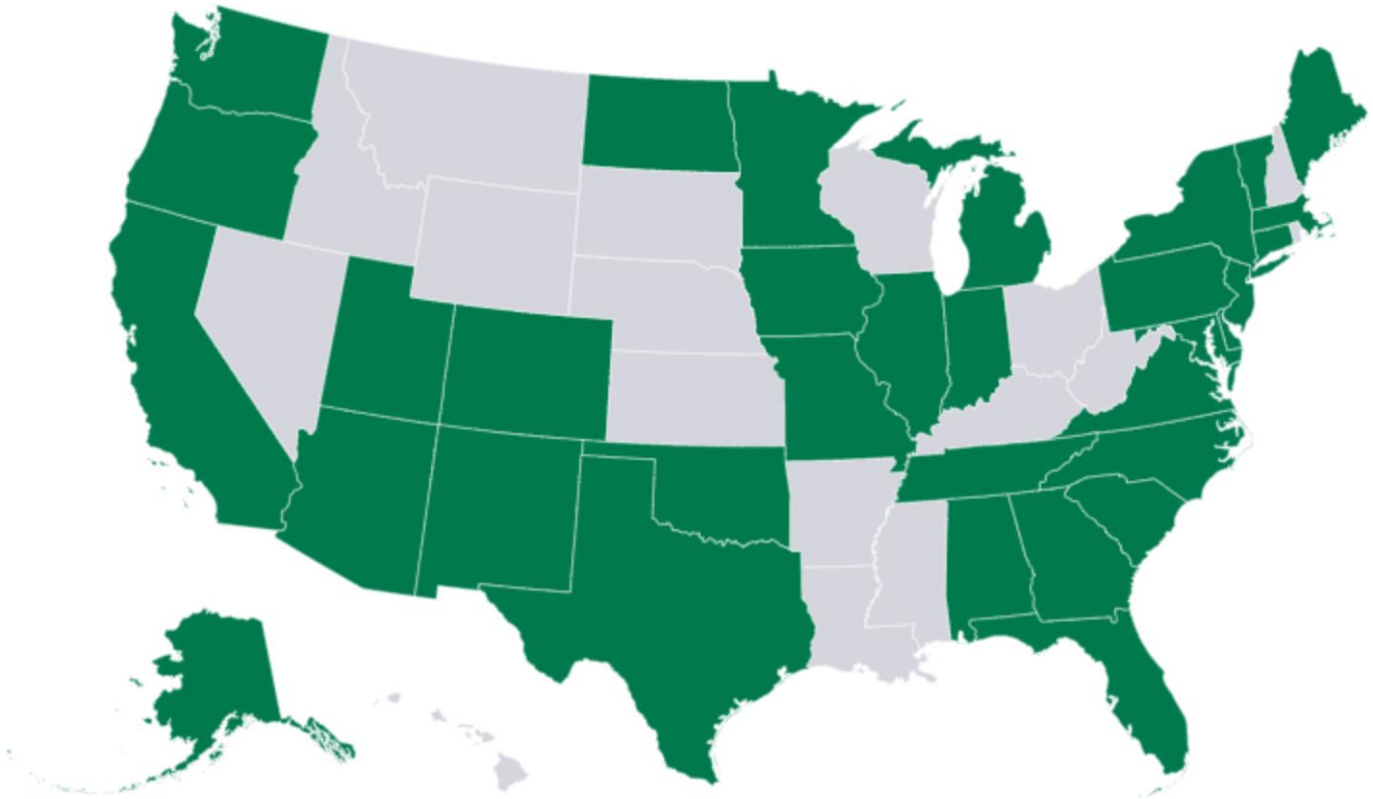
Foundation: **Equity, Communications, Engagement**

THE STATE OF ELECTRIC SCHOOL BUSES

1,100+ ESBS COMMITTED, PROCURED, DELIVERED OR IN OPERATION

Electric School Bus Commitments as of August 2021

School districts across 33 states have announced, procured, received or are operating an ESB



ESBs in at least 33 states
- suburban areas (36%)
- cities (30%)
- towns (17%)
- rural areas (17%)

258 districts (2% of all SDs)

1/3 in top 25% most vulnerable counties

Source: Original WRI data collection, National Center for Education Statistics, 2020;, National Center for Education Statistics, 2018.

NEW FEDERAL ELECTRIC SCHOOL BUS PROGRAM

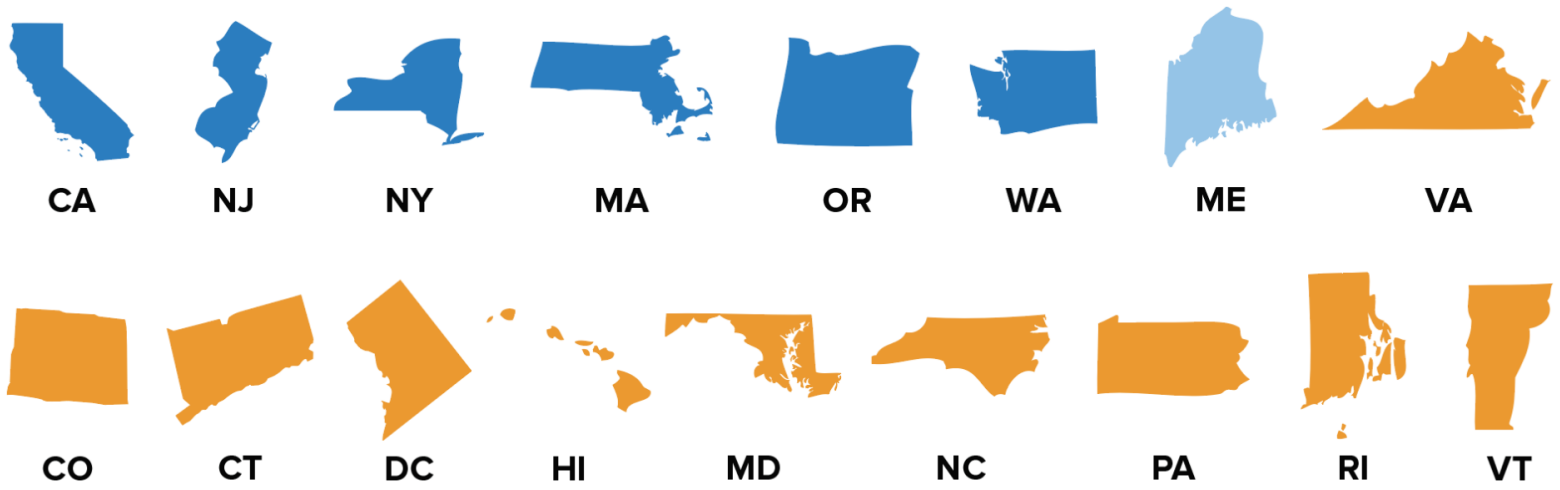
In November 2021, Congress passed the bipartisan Infrastructure Investment & Jobs Act, including a **record $5 billion** to replace older, polluting school buses with cleaner and electric school buses.

Includes **$2.5 billion in dedicated, standalone funding for electric school buses** and another $2.5 billion for electric and alternative fuel school buses.

EPA is charged with **designing** and **implementing** a **Clean School Bus Program** to disburse the funds.

Department of Transportation, Energy, other agencies have authority to provide ESB funding beyond the $5 billion allocated to EPA

STATES EMBRACING TRANSITION TO ESBS



States in MOU States in MOU and ACT State in MOU and ACT Underway

Multi-State Medium Heavy Duty Zero Emission Vehicle (MHDV) Memorandum of Understanding (MOU) coordinated by NESCAUM sets goals of 30% zero-emission MHDV sales by 2030 and 100% zero-emission MHDV sales by 2050.

Advanced Clean Trucks (ACT) Rule sets increasing zero-emission vehicle sales requirements for MHDV manufacturers beginning in 2024. States can adopt CA rule under provisions of the Clean Air Act.

NY Gov. Hochul Proposal

– every new school bus purchased in NY must be electric by 2027, all school buses emissions-free by 2035 (State of State 2022)

Also: Local ESB Goals

New York City

– committed to fully electrifying school bus fleet, 9,500 buses, by 2035

Montgomery County, MD

– committed to fully electrifying school bus fleet, more than 1,400 buses, by 2035

Graphic: Electric Trucks Now

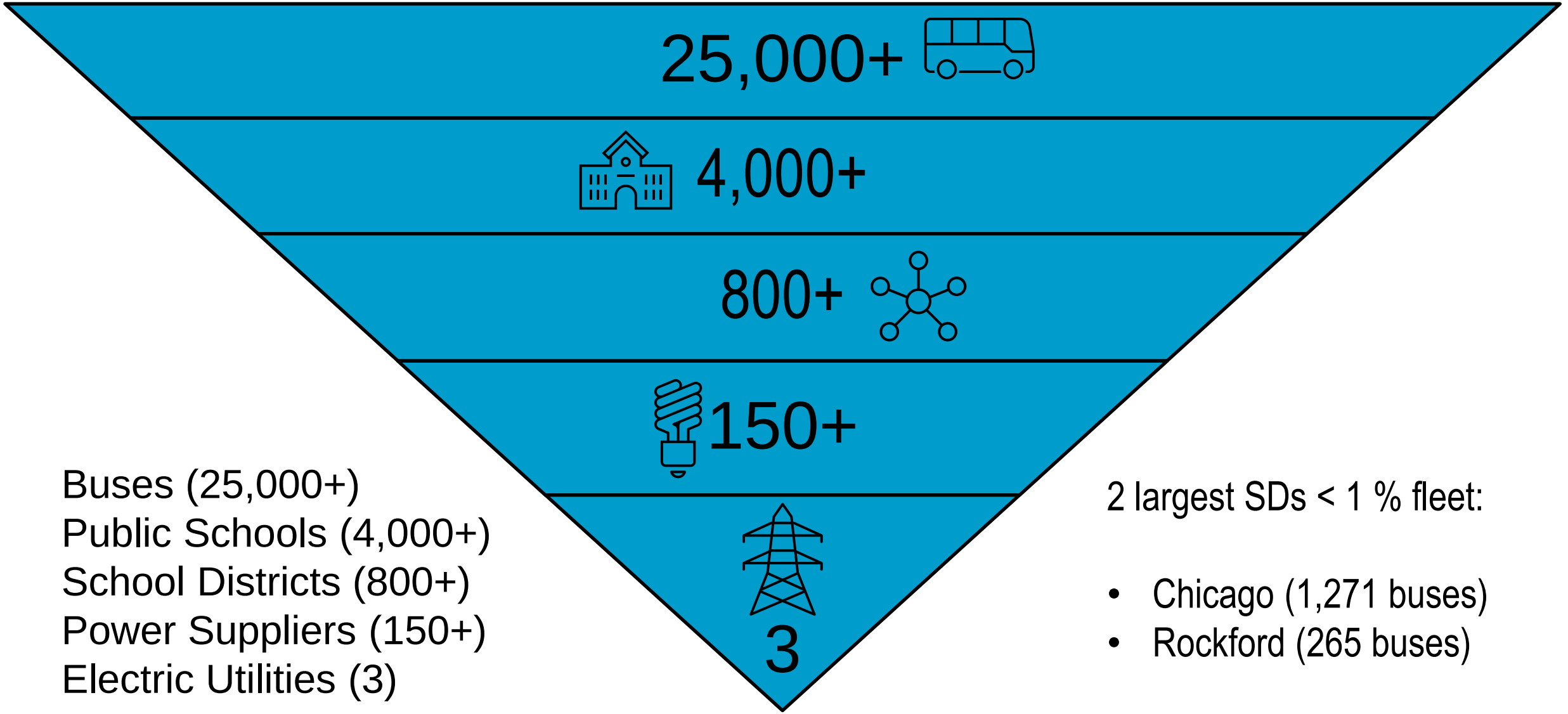
NEW PARTNERS, PLAYERS, BUSINESS MODELS

Key Takeaway: *Enabling a diversity of business models means schools can pursue the approach best for their specific context.*

Roles → ***Business Models***	**Bus owner**	**Charger owner (& Maintenance)**	**Bus operator**	**Bus maintenance**	**Energy/fuel management (software)**	***Example***
Traditional	SD	SD	SD	SD	SD	Williamsfield Schools
Lease	*3rd party*	SD	SD	SD	SD	OEM lessor/dealer
CaaS / IaaS (Charging/Infrastructure)	SD	*3rd party*	SD	SD	*3rd party*	Mobility House, Amply
Fleet/energy manager	SD	SD	SD	SD	*3rd party*	Electriphi
Turnkey asset management	*3rd party*	*3rd party*	SD	SD	*3rd party*	Highland, Levo
TaaS/Contractor (Transportation)	*3rd party*	*3rd party*	*3rd party*	*3rd party*	*3rd party*	Zum, First Student

THE OPPORTUNITY & ROLE OF UTILITIES IN SCALING ESB

UTILITIES CAN HELP ILLINOIS SCALE ESB EFFORTS



Buses (25,000+)
Public Schools (4,000+)
School Districts (800+)
Power Suppliers (150+)
Electric Utilities (3)

2 largest SDs < 1 % fleet:

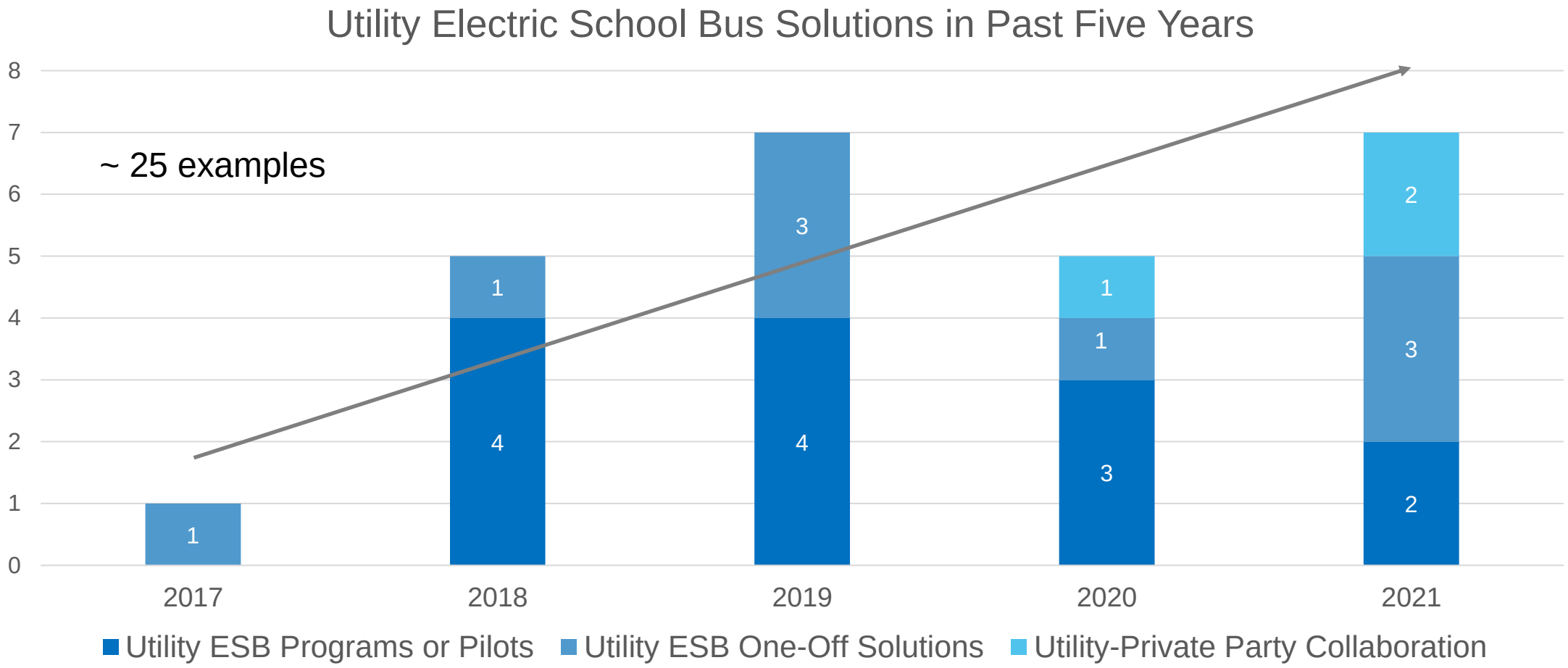
- Chicago (1,271 buses)
- Rockford (265 buses)

Graphics: Public School District Lookup (isbe.net) Illinois Energy Association

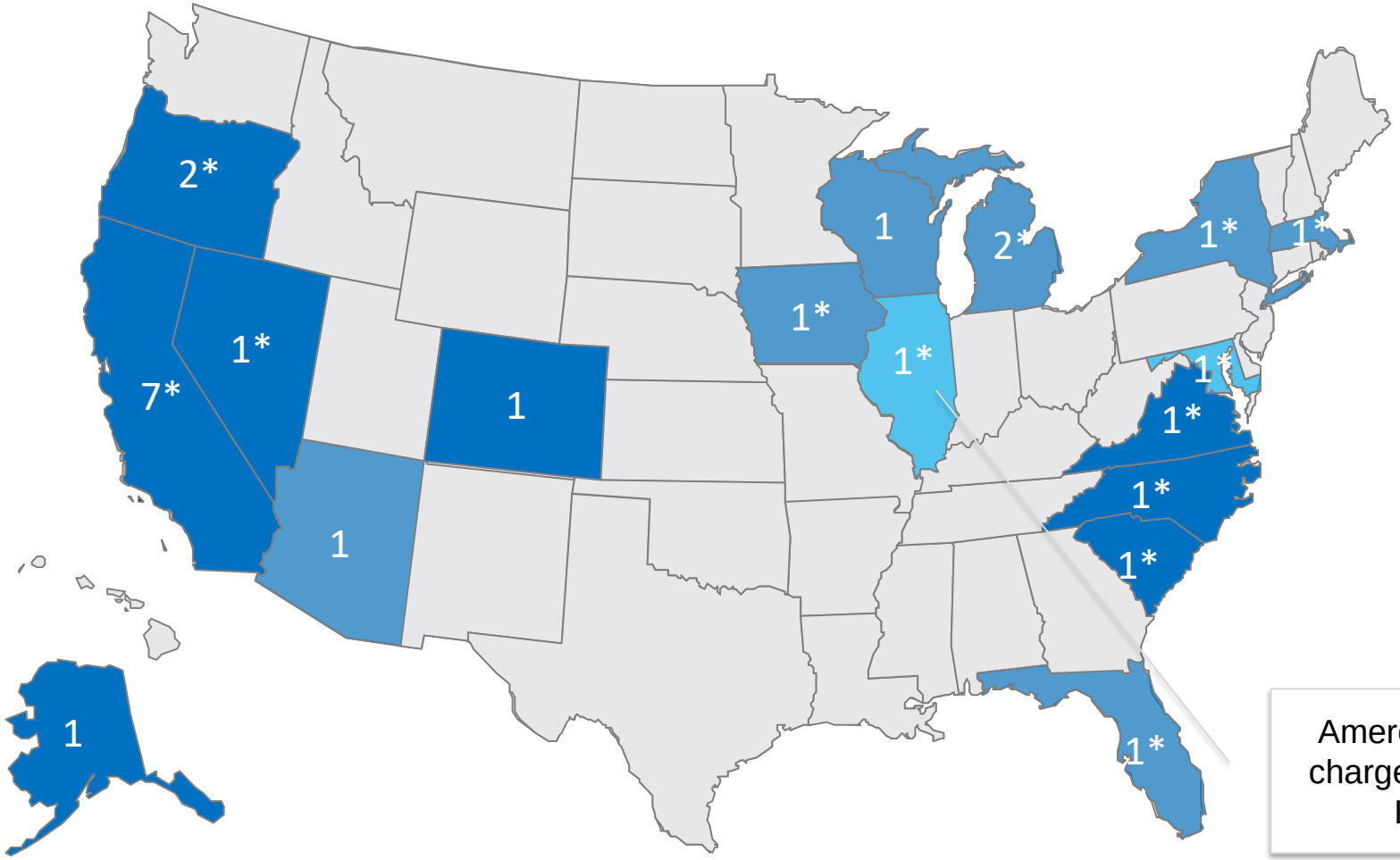
UTILITIES SOLUTIONS INCLUDE PROGRAMS/PILOTS & PRIVATE PARTY COLLABORATION

ESB Solution Approach	*Definition*	*Common Utility Role*	*Examples*
Programs/Pilots	Enable access to or facilitate the use of ESBs through utility programs/pilots available to a class of customers	• ESB funding (e.g., fund ESB transition costs or infrastructure, rebates) • Advisory services (e.g., education & training) • Infrastructure support (e.g., make ready, charger, battery) • Grid integration management (e.g., charging, V2X)	• CA – San Diego Gas & Electric – Power Your Drive for Schools Program – no cost installation of charging infrastructure • VA – Dominion Energy –Electric School Bus Program – 16 school districts can apply for Dominions' funding & support (covers the incremental cost of ESBs, the installation & costs of the batteries)
One-Off Solutions	Enable access to or facilitate the use of ESBs through utility programs/pilots available to an individual or multiple customers on an ad hoc or one-off basis		• FL – Florida Power & Light – supporting West Palm Beach by paying a portion of ESB cost & managing the charging for V2X learnings
Utility-Private Party Collaboration	Enable external ESB program/pilots granting access to or the use of ESBs	• Advisory services (e.g., technical assistance with infrastructure implementation) • Grid integration management (e.g., interconnection of 3rd party enabled ESBs)	• MD – PepCo – Highland Electric Transportation will help with ESB transition & managing the charging, PepCo will support the interconnection

UTILITIES INCREASINGLY PROVIDING ESB ACCESS



SOLUTIONS SPAN 17 STATES AND OFTEN INCLUDE V2G



Utility Electric School Bus Efforts

- ESB Programs/Pilots
- ESB One-off Solutions
- Utility-Private Party Collaboration

* Vehicle-to-grid component

Ameren IL currently aids in the installation of chargers for those school districts that pursue ESBs through VW & state funding

BENEFICIAL CHARGING RATES CAN ADD TO SCALE

ESB Programs / Pilots

ESB One-off Solutions

Utility-Private Party Collaboration

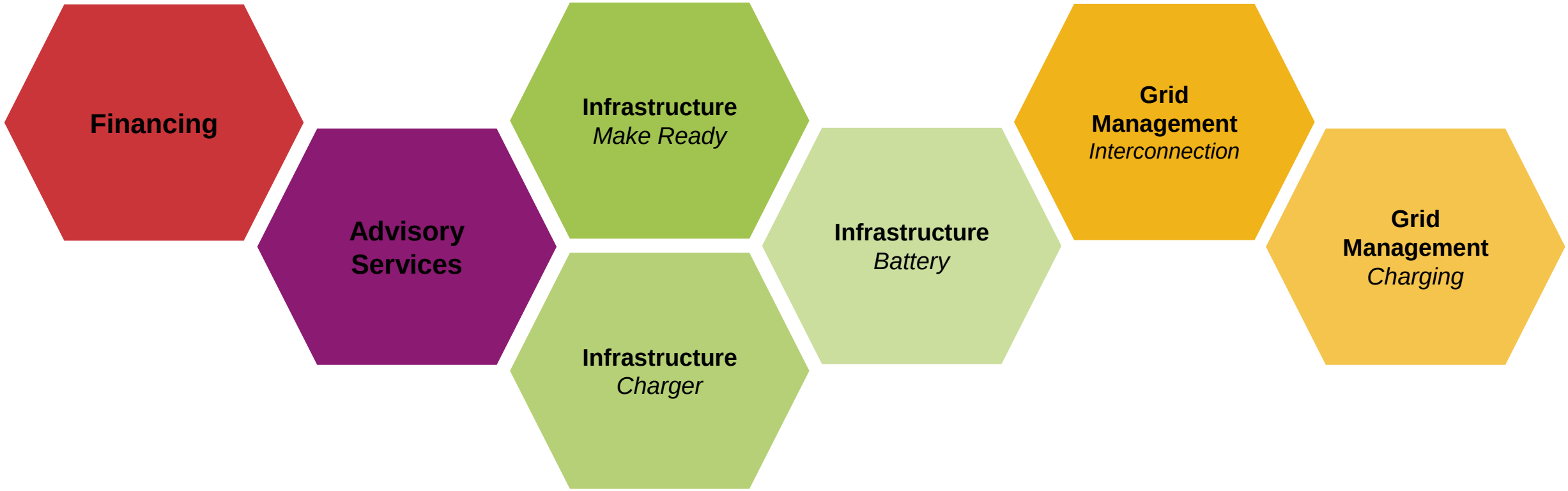
+

Beneficial ESB Charging Rates

- *Definition*: Support or encourage ESB use through beneficial charging rates
  - For example, rates that reflect the flexible nature of the ESB load or variable costs to serve the ESB
- *Common Rates*:
  - Beneficial charging times (e.g., time of use)
  - Tools to mitigate demand charges (e.g., subscription rates or grace periods as fleets scale up)
  - Charging with renewables

UTILITY EXAMPLES

UTILITIES CAN PLAY A VARIETY OF ROLES



EXAMPLE 1 - STOCKTON AND PG&E (CA)

- Program: EVFleet Program
  - Develops infrastructure to and behind the meter & provides rebates for ESB and charging equipment
- Role: Beneficial Charging Rates: Business EV Rate Plans
  - Monthly subscription demand charge + TOU rate
- Also: School District & Utility Problem Solving
  - SUSD engaged early and often with PG&E
  - SUSD informed utility planners of construction timelines and need for interconnection
  - Facilitated discussion with utility and electrical contractor to develop solution for alternate service configuration to use available panel to meet timeline
  - Utility met expedited project timeline interconnection to meet funding requirements

The Electric School Bus Series: Healthier Air for Students in Stockton, California | World Resources Institute (wri.org)

Sources: PGE EV Fleets and PGE-EV Rate

EXAMPLE 2: NATIONAL GRID (MA)

- Program: National Grid MA's ConnectedSolutions Daily Dispatch Program
  - Beverly Public School District
  - Turnkey, fixed-price subscription model

- Role: In partnership with Highland Electric Fleets, 1 ESB tested and successfully delivered power back to grid
  - More than 50 hours over the course of the summer in 2021
  - Discharged nearly 3 MWHs of electricity stored in the bus to help meet peak energy demand over the course of 30 events

National Grid program for stored energy from buses to alleviate energy peaks

Photo: Electric School Bus Fleets Test the US Vehicle-to-Grid Proposition | Greentech Media; PR Highland Electric 10/13; Program details, National Grid

EXAMPLE 3: CON EDISON (NY)

Early Robust Engagement

- 5 members of Con Edison team met early on with NYCSBUS to discuss programs/services
- Identified Con Edison point of contact
- Supplied list of questions for consideration:
  - Number of locations interested in electrifying?
  - Total vehicles at each location? Type of vehicles interested in procuring? Vehicle duty cycle?
  - Desired timeline?
- Con Edison would need the following to add NYCSBUS to project queue:
  - Letter of authorization from landlord
  - Aerial view of site plan
  - Electrical one-line diagram
  - Load letter

Workshop: *Creating an Electrification Roadmap*

- NYCSBUS held two-day workshop to create roadmap for electrification of its bus fleet
- Con Edison attended to provide utility insights and check feasibility of aspirations/timelines
- Key steps identified for during the workshop Con Edison include:
  - Conduct informal site assessment (capacity maps)
  - Conduct formal site assessment (engineering department)
  - Assess charger and site upgrade needs

UTILITY & REGULATOR ESB CONSIDERATIONS

CONSIDERATIONS FOR REGULATORS AND/OR UTILITIES

- **Equity:** How are you addressing and enhancing equity? How are underserved communities involved to speak to wants/needs/benefits?

- **Electrification Cross-Benefits:** How can you define and incorporate benefits in transportation, climate goals, economic development, resiliency, disaster response et al?

- **Intra/Inter-Agency Collaboration:** Who else needs to be involved?
  - Other utilities -- sewer, water and gas?
  - Environmental, transportation, economic development agencies?
  - Local entities including for permits?

- **Funding Sources:** What sources can you leverage? Can funding be stacked for greater benefit and impact?

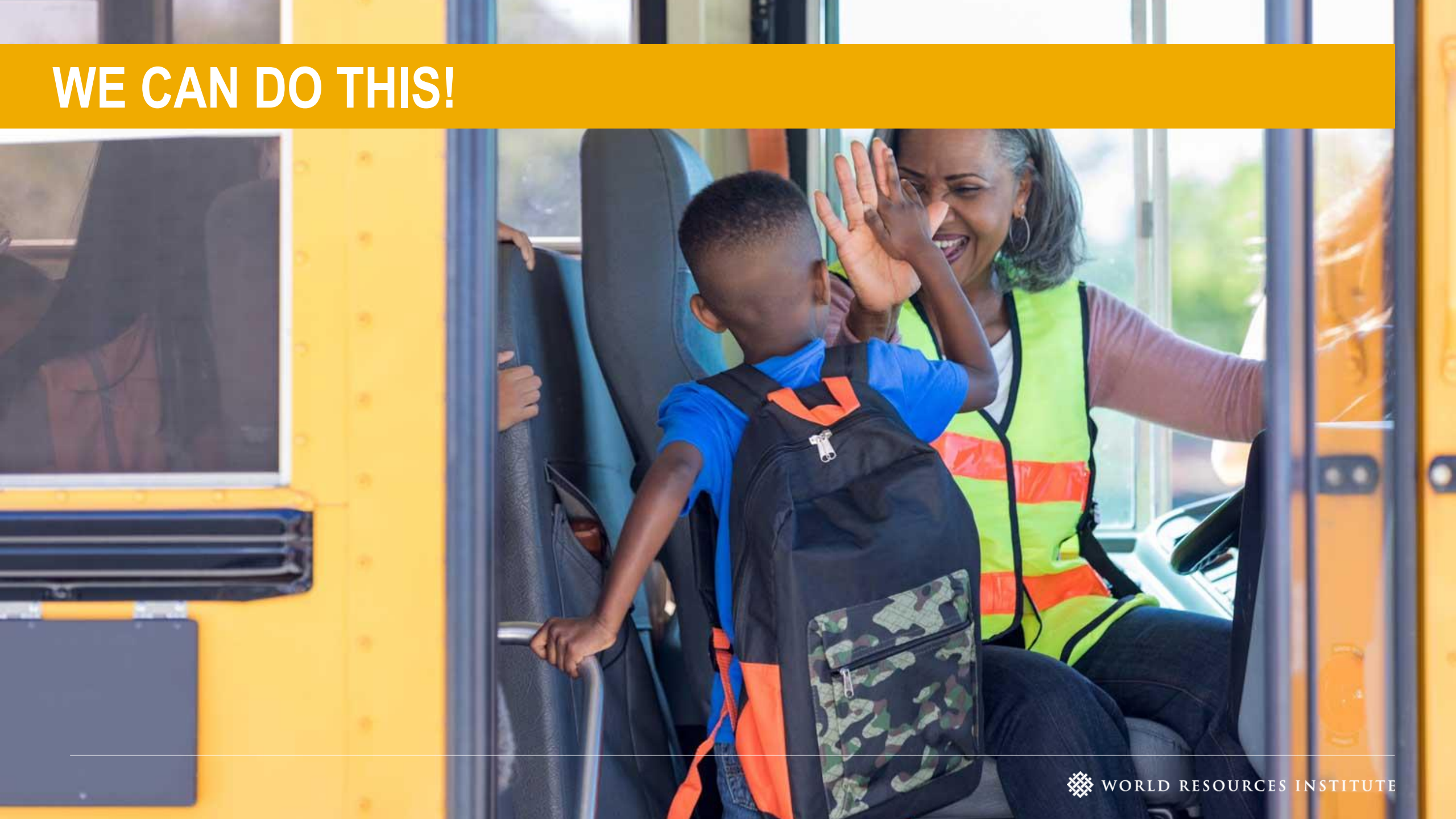
CONSIDERATIONS CONTINUED

- **Program Design:** How can utility rates, transportation electrification planning, and authorization of make-ready infrastructure programs provide benefits to the grid, reduce harmful emissions and support renewable energy growth?

- **Distributed Energy Resources/Managed Load Assets**: How can proper rate design foster greater benefits, limit increased costs and maximize equitable outcomes?

- **Planning**: How can you foster “early and often” utility and school district interactions to save time in the interconnection process? How can you support longer-term planning that can minimize site disturbances and rework and lower costs?

WE CAN DO THIS!



THANK YOU

Find out more at **wri.org/electric-school-buses**